A NORTH AMERICAN HOST OF THE YELLOWJACKET SOCIAL PARASITE *VESPULA AUSTRIACA* (PANZER) (HYMENOPTERA: VESPIDAE)[1,2]

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ABSTRACT: The social parasite, *Vespula austriaca* (Panzer), was found in two colonies of *V. acadica* (Sladen) in northern Idaho. These parasitized colonies were smaller than normal, queen-right *V. acadica* colonies.

Vespula austriaca (Panzer) is a relatively rare Holarctic yellowjacket (Miller, 1961) that has no worker caste and is an obligate social parasite in the nest of other species of yellowjackets. This species has been recorded in the nests of *Vespula rufa* (L.) in Europe (Robson, 1898; Carpenter and Pack-Beresford, 1903; Chitty, 1903; Pack-Beresford, 1904; Weyrauch, 1937; Biegel, 1953; Archer, 1977) and *V. rufa schrencki* Radoszkowski in Japan and East Siberia (Yamane and Kubo, 1970). Only 16 colonies have been reported containing the parasite, and one of these records (Harrison, 1915) is questionable. The few behavioral data available (Robson, 1898; Weyrauch, 1937; Yamane and Kubo, 1970) indicate that the *V. austriaca* female invades an established *V. rufa* nest, kills the host queen, and is aggressive towards the host workers that rear her brood. Evans (1903) presented collection dates of a number of *V. austriaca* females which showed they are active about a month later than queens of their host, *V. rufa*, presumably an adaptation to invade already established nests. The only other behavioral information available about this species is that queens are attracted to the synthetic attractant, heptyl butyrate, so this material can be used to sample occurrence of this species (Reierson and Wagner, 1978).

Vespula austriaca has not been reported from a nest of a Nearctic species. However, distributional data indicate it may be parasitic on several species of the *V. rufa* species group, with *V. acadica* (Sladen) being the most likely host (Wagner, 1978; Akre et al., 1979). Our previous field studies of yellowjackets in Idaho, Oregon, and Washington also suggested this species as the most likely host.

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COLLECTION DATA

During a field study of *V. acadica* biology in northern Idaho, two parasitized colonies were collected in July 1978 in the St. Joe National Forest 4 miles northeast of Harvard (Latah County). The collection area was located in a mature forest, with closed canopy, which borders Strychnine Creek. The major trees present are grand fir (*Abies grandis* (Douglas) Lindl.) and Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) with some western redcedar (*Thuja plicata* Donn). This has been described as a *Thuja plicata-Pachistima myrsinites* habitat type of Daubenmire and Daubenmire (1968). Both colonies were situated in deeply shaded areas in decaying logs on the forest floor. The first colony was collected 10 July and was comprised of 4 *V. acadica* workers and a *V. austriaca* female. The nest consisted of an upper comb (29 pupal, 59 larval, and 53 egg cells) and a lower reproductive comb (12 egg cells). The second colony was collected 18 July and had 5 *V. acadica* workers in addition to the *V. austriaca* female. This nest also had two combs. The upper comb had 20 pupae, 38 larvae, and 31 eggs, while the lower, reproductive comb had only two cells, one with an egg. The entrance tunnels and cavities surrounding the nests were examined carefully for remains of the host queen, but none were found.

In addition to the social parasite, both colonies were infested with the common pupal parasitoid, *Sphecophaga vesparum burra* Cresson (Hymenoptera:Ichneumonidae). During collection of the first colony (10 July), 3 adult *Sphecophaga* flew out of the nest, and 6 cocoons were present in the worker comb. An additional 39 adult *Sphecophaga* emerged over the next 4 weeks. The second colony (18 July) contained 4 adult *S. v. burra,* but no cocoons were visible in the combs. However, 16 adults were collected within the next 4 weeks. The second nest also contained *Melittobia acasta* (Walker) (Hymenoptera:Eulophidae) which parasitized one yellowjacket larva and one pupa in addition to 3 *S. v. burra* prepupae in overwintering cocoons. Other reports of *Melittobia* spp. in vespine nests include Zabriske (1894), Gaul (1940) and Gaul (cited in Thomas, 1960).

COMPARISONS

Table 1 summarizes and compares all available information on host records and sizes of colonies parasitized by *V. austriaca.* The parasite appears to have a detrimental effect on colony size of *V. rufa* as seen in comparisons between normal and parasitized colonies (see also Archer, 1977). A comparable situation was seen in parasitized colonies of *V. acadica* which averaged 4.5 workers and 125 cells as opposed to 48 workers and 426 cells in normal colonies. In this regard it is similar to another yellowjacket social parasite,

Table 1. Comparison of colonies of yellowjackets parasitized by *Vespula austriaca**

Host species	Collection date	Literature source	Country or geographical area	COLONY SIZE AT COLLECTION				Nest Size		
				Host		*Parasite*		#*combs*	#*of cells:*	
				☿	♂	♂	♀		small	large
V. rufa	July	Robson 1898	British Isles	21	?	44	4	2	285[f]	120[f]
	August 7	Carpenter & Pack-Beresford 1903	British Isles	86	3-5	46	9[a]	2	342[f]	150[f]
	August 6	Pack-Beresford 1904	British Isles	4[b]	0	11[c]	0	2	285[f]	150[f]
	July 28	Archer 1977	British Isles	6	0	23	19[a]	2	321	136
V. rufa (normal, mature colonies)[d]		Archer 1977	British Isles	–	–	0	0	3.4	481	649
V. rufa schrenki	July 27	Yamane and Kubo 1970	Japan	9	12	?	3[e]	2	120	15
V. acadica	July 10	1978	Idaho, USA	4	0	0	1	2	147	12
	July 18	1978	Idaho, USA	5	0	0	1	2	89	2
V. acadica (normal colonies)										
	July 12	Roush & Akre 1978	Idaho, USA	39	0	0	0	2	278	93
	July 28	Roush & Akre 1978	Oregon, USA	85	10	0	0	2	393	267
	August 5	Roush & Akre 1978	Oregon, USA	20	0	0	0	2	189	59

[a] one was original parasite queen [b] one was dead [c] only one was alive [d] $\bar{x}$ of 7 nests
[e] one was parasite queen and 2 others were found dead and dismembered within the nest cavity.
[f] estimated from cell sizes of *V. atropilosa* colonies and comb dimensions of *V. rufa* colonies given in the literature. The number of large cells (reproductive combs) is quite variable, thus only the minimum calculated value is given.

*Note added in proof: Additional parasitized nest reported by Archer, M.E. 1978. Naturalist 103: 133-34.

Dolichovespula arctica (Rohwer) (Greene et al., 1978).

Additional parasitism by *Sphecophaga* and *Melittobia* may also have contributed to the small size of both colonies. However, the ichneumonid parasite was also found in five of 8 *V. acadica* colonies without *V. austriaca* (Roush and Akre, 1978) and these colonies were larger.

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